

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**

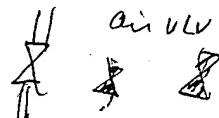
AMENDMENT UNDER 37 C.F.R. § 1.116  
APPLICATION NO. 09/545,834  
ATTORNEY DOCKET NO. Q58793

IN THE CLAIMS:

**This set of claims is a clean set of pending claims 1, 4, 5, 33-41, 66-74, consolidating any previous versions of pending claims into this single clean version. These claims are unchanged in this response.**

**New claims 80-88 appear afterward.**

1. (Amended) An ink jet recording apparatus comprising:  
an ink jet recording head having nozzle orifices from which inkdrops are ejected;  
an ink storage unit for storing ink to be supplied to the recording head;  
an ink flow passage communicating the ink storage unit and the recording head;  
a valve unit for opening/closing the ink flow passage;  
a capping unit for sealing the nozzle orifices, provided with an air hole communicating with the atmosphere;  
an air valve for opening/closing the air hole;  
a suction pump for reducing pressure in an internal space of the capping unit to discharge inkdrops from the nozzles when the capping unit seals the nozzle orifices; and  
a control unit for controlling the valve unit, the capping unit and the suction pump in such order that:  
the suction pump decompresses the internal space of the capping unit under a condition that the valve unit closes the ink flow passage and the capping unit seals the nozzle orifice; and  
the valve unit opens the ink flow passage after a predetermined time period elapses  
wherein the air valve always closes the air hole while the suction pump decompresses the internal space of the capping unit.



AMENDMENT UNDER 37 C.F.R. § 1.116  
APPLICATION NO. 09/545,834  
ATTORNEY DOCKET NO. Q58793

4. The ink jet recording apparatus as set forth in claim 1, wherein the predetermined time period is defined as either a time period required for obtaining a satisfactory deaeration degree of ink between the valve unit and the nozzle orifices, or a time period required for accumulating air bubbles therein.

*Subj C1*  
*B2*

5. (Amended) An ink jet recording apparatus comprising:  
an ink jet recording head having nozzle orifices from which inkdrops are ejected;  
an ink storage unit for storing ink to be supplied to the recording head; an ink flow passage communicating the ink storage unit and the recording head;  
a valve unit for opening/closing the ink flow passage;  
a capping unit for sealing the nozzle orifices;  
a suction pump for decompressing an internal space of the capping unit to discharge inkdrops from the nozzles when the capping unit seals the nozzle orifices; and  
a control unit for controlling the valve unit, the capping unit and the suction pump in such order that:  
the suction pump decompresses the internal space of the capping unit under a condition that the valve unit closes the ink flow passage and the capping unit seals the nozzle orifice;  
the valve unit opens the ink flow passage after a first predetermined time period elapses;  
and  
the suction pump continues decompressing the internal space of the capping unit for a second predetermined time period;  
wherein the controller controls the capping unit such that the decompressed state of the internal space of the capping unit is maintained while the suction pump is driven.

*B3  
Bn*

33. (Amended) The ink jet recording apparatus as set forth in any one of claims 1 and 5, wherein the valve unit includes:

AMENDMENT UNDER 37 C.F.R. § 1.116  
APPLICATION NO. 09/545,834  
ATTORNEY DOCKET NO. Q58793

B3  
Conf'd

---

a valve control chamber which constitutes a part of the ink flow passage;  
a flexible diaphragm which constitute a bottom wall of the valve control chamber;  
an actuation body for deforming a center portion of the diaphragm in a direction perpendicular thereto.

34. The ink jet recording apparatus as set forth in claim 33, wherein the valve control chamber has an entrance port formed on a top wall thereof at a portion where is away from the center portion of the diaphragm, and an exit port formed on the top wall at right above the center portion of the diaphragm.

35. The ink jet recording apparatus as set forth in claim 34, wherein the entrance port is arranged below the exit port.

36. The ink jet recording apparatus as set forth in claim 34, wherein the circumferential portion of the exit port is tapered such that a diameter of the port is reduced toward the above.

37. The ink jet recording apparatus as set forth in claim 34, wherein the diaphragm includes an annular convex on the center portion thereof for sealing the exit port when the diaphragm is deformed by the actuation body.

38. The ink jet recording apparatus as set forth in claim 37, wherein an annular groove is formed so as to surround the exit port, against which the annular convex is to be abutted; and wherein an outer peripheral wall of the groove is tapered such that a diameter of thereof is reduced toward the above.

AMENDMENT UNDER 37 C.F.R. § 1.116  
APPLICATION NO. 09/545,834  
ATTORNEY DOCKET NO. Q58793

39. The ink jet recording apparatus as set forth in claim 38, wherein a distance between the annular convex and the annular groove is 1.0 - 1.3 mm when the ink flow passage is opened.

40. The ink jet recording apparatus as set forth in claim 34, wherein a cross sectional area of the ink flow passage between the exit port and the recording head becomes larger as further from the exit port.

41. The ink jet recording apparatus as set forth in claim 33, wherein the actuation body is a rod member arranged below the diaphragm.

66. (Amended) A cleaning control method for an ink jet recording apparatus which comprises:

an ink jet recording head having nozzle orifices from which inkdrops are ejected;  
an ink storage unit for storing ink to be supplied to the recording head; an ink flow passage communicating the ink storage unit and the recording head;  
a valve unit for opening/closing the ink flow passage;  
a capping unit for sealing the nozzle orifices, provided with an air hole communicating with atmosphere;  
an air valve for opening/closing the air hole;  
a suction pump for reducing pressure in an internal space of the capping unit to discharge inkdrops from the nozzles when the capping unit seals the nozzle orifices, the method comprising the steps of:  
closing the air hole using the air valve;  
sealing the nozzle orifices by the capping unit;  
closing the ink flow passage by the valve unit;  
driving the suction pump to decompress the internal space of the capping unit;  
holding the decompressed state for a predetermined time period; and

*B4  
CONF*

AMENDMENT UNDER 37 C.F.R. § 1.116  
APPLICATION NO. 09/545,834  
ATTORNEY DOCKET NO. Q58793

opening the ink flow passage by the valve unit  
wherein the air valve always closes the air hole while the suction pump decompresses the //  
internal space of the capping unit.

67. The cleaning control method as set forth in claim 66, wherein the sealing step and the closing step are executed synchronously or exchangeably.

68. The cleaning control method as set forth in claim 66, wherein the predetermined time period is defined as either a time period required for obtaining a satisfactory deaeration degree of ink between the valve unit and the nozzle orifices, or a time period required for accumulating air bubbles therein.

*B5  
Conf  
Sub C1*

69. (Amended) A cleaning control method for an ink jet recording apparatus which comprises:

an ink jet recording head having nozzle orifices from which inkdrops are ejected;  
an ink storage unit for storing ink to be supplied to the recording head;  
an ink flow passage communicating the ink storage unit and the recording head;  
a valve unit for opening/closing the ink flow passage;  
a capping unit for sealing the nozzle orifices;  
a suction pump for reducing pressure in an internal space of the capping unit to discharge inkdrops from the nozzles when the capping unit seals the nozzle orifices, the method comprising the steps of:  
sealing the nozzle orifices by the capping unit;  
closing the ink flow passage by the valve unit;  
driving the suction pump to decompress the internal space of the capping unit;  
holding the decompressed state for a first predetermined time period; and  
opening the ink flow passage by the valve unit while driving the suction pump;

AMENDMENT UNDER 37 C.F.R. § 1.116  
APPLICATION NO. 09/545,834  
ATTORNEY DOCKET NO. Q58793

*B5  
B7d  
C1*  
~~wherein the decompressed state of the internal space of the capping unit is maintained while the suction pump is driven.~~

70. The cleaning control method as set forth in claim 69, wherein the sealing step and the closing step are executed synchronously or exchangeably.

71. The cleaning control method as set forth in claim 69, further comprises the step of stopping to drive the suction pump after a second predetermined time period has elapsed since the ink flow passage was opened.

72. The cleaning control method as set forth in claim 69, further comprises the step of driving the suction pump between the sealing step and the closing step.

73. The cleaning control method as set forth in claim 71, further comprises the step of driving the suction pump again after the stopping step has executed.

74. The cleaning control method as set forth in claim 73, further comprises the steps of: releasing the capping unit from the nozzle orifices after the suction pump has driven again; and driving the suction pump again to discharge ink from the nozzle orifices in a capping released state.

80. (New) An Ink jet recording apparatus comprising:  
an ink jet recording head having nozzle orifices from which inkdrops are ejected; ✓  
an ink storage unit for storing ink to be supplied to the recording head; ✓  
an ink flow passage communicating the ink storage unit and the recording head; and ✓  
a valve unit for opening/closing the ink flow passage, the valve unit including: ✓

*R  
Wn/X  
Sub  
C1*

AMENDMENT UNDER 37 C.F.R. § 1.116  
APPLICATION NO. 09/545,834  
ATTORNEY DOCKET NO. Q58793

a valve control chamber which constitutes a part of the ink flow passage; ✓  
a flexible diaphragm which constitute a bottom wall of the valve control chamber; and  
an actuation body for deforming a center portion of the diaphragm in a direction  
perpendicular thereto.

b04

*Sub C1*  
*B6*  
*Onix*

81. (New) The ink jet recording apparatus as set forth in claim 80, wherein the valve control chamber has an entrance port formed on a top wall thereof at a portion where is away from the center portion of the diaphragm, and an exit port formed on the top wall at right above the center portion of the diaphragm.

82. (New) The ink jet recording apparatus as set forth in claim 81, wherein the entrance port is arranged below the exit port.

83. (New) The ink jet recording apparatus as set forth in claim 81, wherein the circumferential portion of the exit port is tapered such that a diameter of the port is reduced toward the above.

84. (New) The ink jet recording apparatus as set forth in claim 81, wherein the diaphragm includes an annular convex on the center portion thereof for sealing the exit port when the diaphragm is deformed by the actuation body.

85. (New) The ink jet recording apparatus as set forth in claim 84, wherein:  
an annular groove is formed so as to surround the exit port, against which the annular convex is  
to be abutted; and  
wherein an outer peripheral wall of the groove is tapered such that a diameter of thereof is  
reduced toward the above.

AMENDMENT UNDER 37 C.F.R. § 1.116  
APPLICATION NO. 09/545,834  
ATTORNEY DOCKET NO. Q58793

- B6  
Confidential  
Subj C
86. (New) The ink jet recording apparatus as set forth in claim 85, wherein a distance between the annular convex and the annular groove is 1.0-1.3 mm when the ink flow passage is opened.
87. (New) The ink jet recording apparatus as set forth in claim 81, wherein a cross sectional area of the ink flow passage between the exit port and the recording head becomes larger as further from the exit port.
88. (New) The ink jet recording apparatus as set forth in claim 80, wherein the actuation body is a rod member arranged below the diaphragm.
-